PATENT SPECIFICATION

Application Date: Dec. 19, 1930. No. 38,297/30. **367,496**

Complete Left: Oct. 19, 1931.

Complete Accepted: Feb. 25, 1932.

PROVISIONAL SPECIFICATION.

Improvements in and relating to Regulating Valves.

I, FRANK EDGELER WILLIAMSON, 13, Coupar Street, Dundee, British subject, do hereby declare the nature of this invention to be as follows:—

The purpose of this invention is to provide a simple and convenient means of regulating the pressures of fluids and gases. In one form of the said invention a piston is inserted into the operating system. In the centre of the piston there is a hole through which the fluid or gas may pass. This piston is ordinarily held against a seating by a suitable spring. Facing the hole in the piston is a needle or pin which may be moved backwards or forwards by means of a screw or other suitable arrangement. When fluid or gas is passed into the system the piston is moved forward according to the difference of pressure or vacuum on either side of th valve and the strength of the spring. This movement brings the hole in the piston towards the needle or pin, thus reducing the passage for the fluid or gas.

In one form of the said invention a diaphragm is used to take the place of the piston and spring. This has a hole in it similar to the piston described above. The diaphragm being flexible moves forward under pressure or vacuum and being elastic recovers itself when the load is taken off. The needle or pin and the general action of the valve are as previously described.

In one form of the said invention the needle, or pin is cut along a part of its length with a groove or grooves in order that fluid or gas may pass even when the valve is on its seat. This result may be also achieved by providing a hole or holes in the piston or diaphragm as the case may be.

Dated the 18th day of December, 1930.

F. E. WILLIAMSON,

COMPLETE SPECIFICATION.

Improvements in and relating to Regulating Valves.

I, FRANK EDGELER WILLIAMSON, 13, Coupar Street, Dundee, British subject, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The purpose of this invention is to provide a simple and convenient means of regulating the pressures of fluids and gases. It is found that circuits conveying fluids and gases may deliver widely varying quantities per unit of time even when there is no change in the length, cross section or general features to alter the resistance to flow. The cause of this discrepancy is to be found in the fluctuation of the pressure or head responsible for the movement of the fluid or gas. A common instance of this state of affairs is met in circuits attached to gravitation water supplies.

I am aware that it has been previously proposed to construct apparatus for controlling the flow of fluids in which regulation is obtained by means of a ported piston or diaphragm moving under the pressure of the liquid or gas, and which tends to close the passage for the liquid or gas by approaching a pointed needle. In one known arrangement the piston moves against the action of a spring but differs from my invention in that the needle is non-adjustable and the port is eccentric. The former feature in my opinion very much reduces this utility of the apparatus and the latter introduces manufacturing and operating difficulties, which are avoided by the use of a central port. In another known arrangement operated by a diaphragm, the needle is adjustable but no spring loading is employed.

In general terms the present invention consists of a housing within which moves a piston under the pressure of a fluid or gas. This movement is resisted by a spring. Use is made of the movement to

open and close an orifice in the piston. This alteration of the free area of efflux is effected by a needle which is either in front of the piston or inside it. As the pressure rises the piston moves forward thus causing the needle to enter the orifice or if it is within it to move further along the orifice. The result in both cases being that the free area of the orifice is reduced in an inverse ratio to the pressure. Alternately the piston and spring may be replaced by a diaphragm, capsule or bellows. The needle is adjustable at will to give the quantity of fluid or gas required. In another form of the said invention additional regulation is obtained by arranging for the piston in moving forward to cover the outlet port in proportion to the pressure driving it forward. Generally it will be convenient to have the discharge from the valve at right angles to the flow since this arrangement simplifies adjustment and access to the parts, but the apparatus may be designed for uni-directional flow if desired.

In order that my said invention may be understood I append hereunto two sheets of drawings.

Fig. 1 is a sectional elevation of a regulating valve fitted with spring and one piece adjusting needle. Fig. 2 is a sectional elevation of the apparatus shewn in Fig. 1 at OP. Fig. 3 is a sectional elevation of regulating valve fitted with a spring and a two piece adjusting needle. Fig. 4 is a sectional elevation of the apparatus shewn in Fig. 3 at QR. Fig. 5 is a sectional elevation of a regulating valve fitted with a diaphragm, capsule or bellows and a one piece adjusting needle. Fig. 6 is a sectional elevation of the apparatus shewn in Fig. 5 at ST. Fig. 7 is a sectional elevation of a regulating valve fitted with a diaphragm, capsule or bellows and two piece adjusting needle. Fig. 8 a is sectional elevation of the apparatus shewn in Fig. 7 at UV. Fig. 9 is a sectional elevation of a regulating valve fitted with a spring and one piece adjusting needle and having a longitudinal slot cut in the housing at the outlet. Fig. 10 is a sectional elevation of the apparatus shewn in Fig. 9 at WX. Fig. 11 is a sectional elevation of a regulating valve with a diaphragm, capsule or bellows and one piece adjusting needle. Fig. 12 is a sectional elevation of the apparatus shewn in Fig. 11 at YZ.

In the various figures of the drawings I have shewn one form of housing A, but it will be readily understood that this part may be altered to suit the particular work for which the valve is required. B, Figs. 1, 3, 5, 7, 9, 10 and 11 is a cap or cover protecting the end of the adjusting needle and may be of any convenient form. The piston C Figs. 1, 3 and 9, which may be made of any suitable material is provided with a hole D, Figs. 1, 3, 4 and 9 through which passes the fluid or gas. The piston will in some cases be made hollow where this is desirable for the sake of lightness or for other reasons. This is indicated by the dotted line M, Fig. 1. Further the piston may be fitted with rings and or provided with washers to make it fluid or gas tight. These parts are not shewn on the drawings. Again the piston may be provided with a shoulder to hold the spring in position. This is illustrated in Fig. 9. A spring E, Figs. 1, 3, 9 and 10 is shewn of circular section and of cylindrical form. It may however be of any suitable section and take the form of a volute or double volute or again be of any special but suitable design. It may be made of any suitable elastic material in order to be unaffected by the controlled medium. The plug F Figs. 1, 2, 3, 5, 7, 9 and 11 may function in two ways. In the first case it supports the adjusting needle in all cases illustrated, but is further used for setting the position of the piston, diaphragm, capsule or bellows relative to the slotted port or outlet 2, Figs. 9, 10, 11 and 12. Where uni-directional flow of the medium is desired as in a straight pipe line a part of the plug F is cut away along its length to a passage or passages for the fluid or gas. This is indicated by the dotted lines L, Fig. 1. When this is done the outlet K shewn in all figures will be closed or will be omitted entirely from the housing A. The cap or cover B will also be omitted. The adjusting needle may be made in one or two parts as is found more convenient. Figs. 1, 3, 5, 9, 10 and 11 shew the needle made in one piece and it is there indicated by the letter G. It is suitably pointed and may be moved to or from the piston or diaphragm, capsule or bellows by turning it in the plug F. Figs. 3, 4, 7 and 8 shew the needle made in two pieces which are indicated by the letters G_1 and G_2. G_1 serves to propel the part G_2 through the piston for regulating purposes. The part G_2 is shewn in Figs. 3 and 4 conveniently supported in the piston, but it is clear that other means may be taken to support it. While in the case of G variation in the flow is obtained by the fact that the part is pointed, in G_2 the same effect is arranged for by suitably grooving the part along its length. This grooving tapers to the diameter of the orifice in piston or diaphragm, capsule or

bellows. Again flats may be filed on G_2 for the same purpose.

The diaphragm, capsule or bellows I, Figs. 5, 7, and 11, which takes the place of the spring and piston in some forms of the said invention may be of metal or any other suitable material. The illustrations appended shew this part composed of sections to permit of adequate movement within the elastic limit. In some cases however one section would suffice and where extremely small dilation is all that is called for a single plate or diaphragm may even be used. In one form of the said invention the diaphragm capsule or bellows is merely fixed in the partition H_2 and is not supported at the front by the sliding partition H_1. Since however the capsules and bellows are made of thin material in order to obtain resiliency it is preferable to strengthen them at the front in the manner indicated in the figures and mentioned above. The partition H_1 is accordingly sweated, soldered or otherwise attached to the front of the capsule or bellows. This part is suitably drilled for the passage of the fluid or gas as the case may be.

Having now described the various operating parts the working of the valve and the reason why it regulates fluids and gases will be easily followed. When by means of suitable couplings the valve is connected in series with a circuit whose output it is desired to control the fluid or gas enters at the inlet J, Figs. 1, 3, 5, 7, 9 and 11 and passes through the hole or orifice in the piston, diaphragm, capsule or bellows as the case may be. It then finds its way past the needle and through the spring in the forms shewn in Figs. 1, 3, and 9. In the cases indicated in Figs. 5 and 7 after passing through the diaphragm, capsule or bellows the medium escapes through the ports 3 to the outlet. In the form of the invention shewn in Figs. 11 and 12 the medium must further pass through the ports 4 to the exit.

As the pressure of fluid or gas in the system fluctuates it is clear that the piston, diaphragm, capsule or bellows will respond and alter the relative position of the active part of the needle with respect to the hole or orifice conveying the medium and correspondingly reduce or increase the free area for the passage of the fluid or gas. It will be plain also that by moving the adjustable needle G or G_1 towards the orifice a lesser movement of the piston or diaphragm, capsule or bellows will be necessary to cut down the flow of the medium.

The purpose of the forms shewn in Figs. 9, 10, 11 and 12 is to achieve a somewhat finer regulation. This is obtained by a process of double regulation. The piston, spring, diaphragm, capsule or bellows regulate as previously described, but the piston C, Fig. 9, and the sleeve C_1, Fig. 11, which is attached to or cast in one piece with the sliding partition H_1 also take a part in the regulation. This is accomplished by making the port 2 in the shape of a narrow slot as shewn in Figs. 9, 10 and 11. As the pressure on the piston, diaphragm, capsule or bellows increases the piston or sleeve moves over the narrow slot 2 with a consequent reduction of the outlet area. In the figures the piston and sleeve are shewn in line with the port 2 and accordingly to achieve entire cut-off they will require to travel the whole length of the port. This may not suit the circumstances and a smaller travel must be arranged for. This is obtained by slacking back the plug F. Regulation is thus obtained, which may suffice in some cases. Where finer regulation is required this may be achieved by adjusting the needle G or G_1 in the manner previously described.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A regulating valve for liquids and gases in which the regulation is obtained by means of the action of a piston moving under the pressure of the liquids or gases which tends to close the passage for the liquids and gases by approaching a pointed needle or passing over a grooved or otherwise reduced needle against the resistance of a spring in compression or tension, the pointed and grooved or otherwise reduced needle being capable of adjustment towards and from the piston.

2. A regulating valve as claimed in Claim 1 but having a diaphragm, capsule or bellows instead of the piston and spring.

3. A regulating valve as claimed in Claim 1 or Claim 2 but having a narrow slot over which the piston moves and reduces the free area for the passage of the medium, thus regulating the flow through the valve.

4. A regulating valve as claimed in Claim 2 or Claim 3 in which a sleeve is attached to the diaphragm, capsule or bellows.

5. A regulating valve as claimed in Claim 1 constructed for the purposes set forth herein and substantially as shewn in Figs. 1 and 2.

6. A regulating valve as claimed in Claim 1 constructed for the purposes set forth herein and substantially as shewn

in Figs. 3 and 4.

7. A regulating valve as claimed in Claim 2 constructed for the purposes set forth herein and substantially as shewn in Figs. 5 and 6.

8. A regulating valve as claimed in Claim 2 constructed for the purposes set forth herein and substantially as shewn in Figs. 7 and 8.

9. A regulating valve as claimed in Claim 3 constructed for the purposes set forth herein and substantially as shewn in Figs. 9 and 10.

10. A regulating valve as claimed in Claim 4 constructed for the purposes set forth herein and substantially as shewn in Figs. 11 and 12.

Dated the 17th day of October, 1931.

F. E. WILLIAMSON.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1932.

SHEET 1

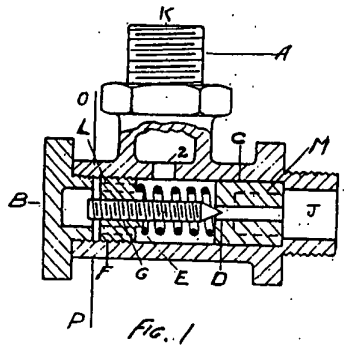

FIG. 1

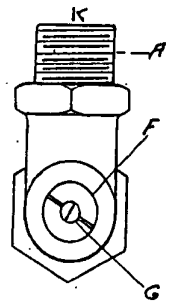

FIG. 2

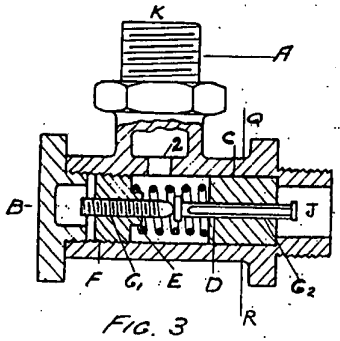

FIG. 3

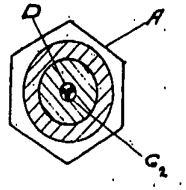

FIG. 4

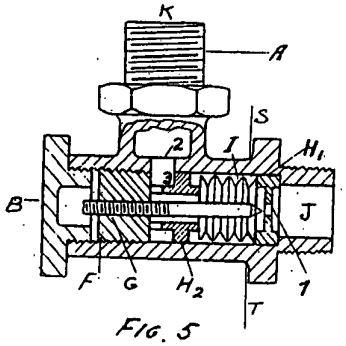

FIG. 5

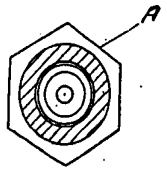

FIG. 6

SHEET 2

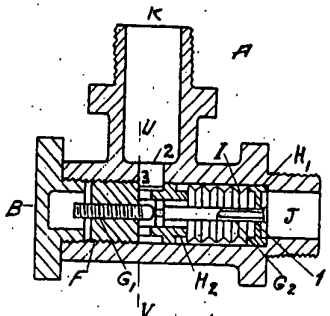

FIG. 7

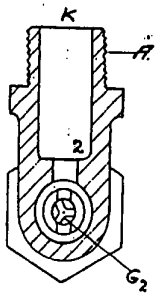

FIG. 8

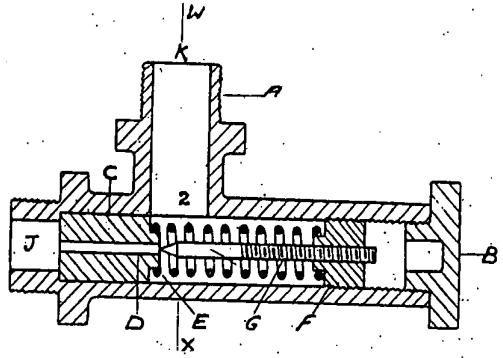

FIG. 9

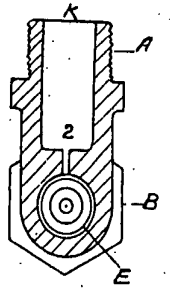

FIG. 10

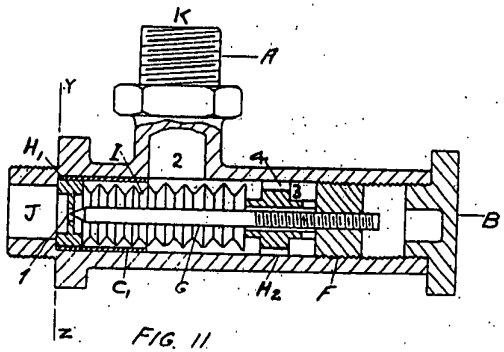

FIG. 11

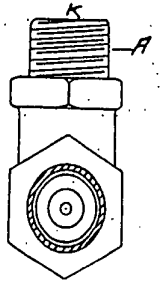

FIG. 12

Charles & Read Ltd. Photo Litho.